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Studies on Molten Salt Thermocells

Haruo NAGAI*

Initial thermoelectric powers in the systems (T_1)Ag/AgCl-LiCl·KCl(eutectic composition)/Ag(T_2), and (T_1)Ni/$NiCl_2$-LiCl·KCl(eutectic composition)/Ni(T_2) were measured and the results were discussed. The contents of AgCl and $NiCl_2$ in the melts were 0.01～0.2 mole fraction and temperature differences were changed from 10° to 120°C, keeping average temperature near 500°C.

In these conditions, the initial thermoelectric powers of the cell were proportional to the temperature differences, and hotter electrode was always anode. The effect of composition was large.

By estimating entropy of Ag^+ and Ni^{2+} in the melts, it was possible to calculate the temperature coefficients of electrode potentials of each electrode, and after this, it was found that the thermoelectric powers are mostly due to the temperature change of electrode potentials and contribution of initial thermal diffusion potentials are small.

In order to see the effect of addition substance which has no effect on the cell reaction, $PbCl_2$ was tried, the content being 5 mole %.

Using these results, the difference of initial thermal diffusion potentials between the systems, $PbCl_2$ (5 mole%)-LiCl·KCl (eutectic composition) and pure LiCl·KCl(eutectic composition), was estimated. In this estimation, the data of the change of mixing entropy of Ag^+ and Ni^{2+} in the case of containing 5 mole % $PbCl_2$ which were obtained experimentally, were used.

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